

Remarks

Claims 1-36 are pending in this application. Claims 1-36 stand rejected.

The rejection of Claims 1-36 under 35 U.S.C. § 102(e) as being anticipated by Nambu et al. (U.S. Pat. 6,196,715) is respectfully traversed.

In accordance with 37 C.F.R. 1.136(a), a three month extension of time is submitted herewith to extend the due date of the response to the Office Action dated December 18, 2003 for the above-identified patent application from March 18, 2004 through and including May 18, 2004. Authorization to charge a deposit account in the amount of \$420.00 to cover this extension of time request also is submitted herewith, plus an additional amount to cover the accompanying Request for Continued Examination. In the event that the requested extension of time or the authorized fee payment is insufficient to allow entry of this Amendment and the Request for Continued Examination, the Commissioner is authorized to consider this a request for the necessary extension of time and authorization to charge the deposit account the necessary amount.

Nambu et al. describe an X-ray tomosynthesis system including a patient couch (10), an X-ray tube (12), an X-ray detector (14), a supporting member (16), and a control apparatus (18). (See column 10, lines 15-19) Notably, Nambu et al. are silent with respect to Computed Tomography (CT). Rather, Nambu et al. describe tomographic slices made via an x-ray tomosynthesis wherein axial slices are constructed by rearranging the tomographic slices. (See, e.g., column 38, section 8.3) Applicants submit that there are fundamental differences between Computed Tomography tomograms and tomosynthesis. In particular, for computed tomographic imaging, rotation of the source and detector array through an angle of 180 degrees plus a fan angle is required. See Exhibit A, Parker, D., "Optical short scan convolution reconstruction for fanbeam CT," Med. Phys. 9(2), March/April 1982, pp. 254-257, especially near the top of the second column of page 254, and Exhibit B, Chapter 3, "Algorithms for Reconstruction with Nondiffracting Sources," from a book by Kak & Slaney entitled "Principles of Computed Tomography," 1988, especially pages at 93-99.

Moreover, there is no teaching or suggestion in Nambu et al. that the structures and methods cited by the Office as anticipating Applicants' structures and methods rotate in a manner required by CT. For example, in rejecting Claim 1, the Office cites Nambu et al. at col. 53, line 35+ and column 58, line 26+ for selecting a computed tomography volume mode. The device described in these passages is shown in Figs. 68 through 71. As indicated at col. 53, lines 45-51, C-shaped arm 204 is supported by a supporting pillar 205. Between the supporting pillar 205 and the C-shaped arm 204 is provided a holder 205A which supports slide-rotatably the C-shaped arm 204 about its slide-rotation axis. This holder 205A is rotatably attached to the supporting pillar 205A about its rotation axis perpendicular to the slide-rotation axis.

The rotation axis and the slide-rotation axis are not shown in Figs. 68-71. However, Applicants submit that there is no teaching in the passages and figures cited by the Office for CT operation. More particularly, Nambu et al. do not explain how the structure illustrated in Figs 68-71 rotates through a minimum angle of 180 degrees plus a fan angle around a z-axis as is necessary to provide data for computed tomographic reconstruction. Particularly, the offset of holder 205A about a joint connecting it to pillar 205 by 180 degrees would not rotate a fan beam from x-ray source 202 and detector 203 around a z-axis around a patient so as to provide the angular views necessary for CT reconstruction. It also does not appear that sliding C-shaped arm 204 through the holder, as shown in Fig. 80A, would allow rotation of 180 degrees plus a fan angle due to the presence of the holder. Moreover, Fig. 80A shows detector 203 in a position mechanically uncoupled from C-shaped arm 204, so it is apparent CT operation is not contemplated by the operation shown in Fig. 80A.

At col. 58, line 26+, Nambu et al. state that three dimensional reconstruction requires image information from at least a view range of 180 degrees. Thus, because the X-ray diagnostic system is constructed in the signal plane type [sic], during first view range of 90 degrees, radiography is executed by rotationally driving the X-ray detector as shown in Figure 75. If radiography is intended to be executed at angles more than 90 degrees in this situation, the angle of the X-ray detector to the X-ray focusing direction becomes too deep [sic] to cover by the detector all X-ray beams transmitting a patient's objective region. To avoid this, on completing the first radiography for the first view range of 90 degrees, the angle of X-ray detector 203 is rotated by 90 degrees, as shown in Fig. 76, and the x-ray detector 203 is constantly controlled to

be directed along a direction perpendicular to the vertical direction, regardless of the rotation angles of C-shaped arm 204, like in the first view range of 90 degrees. This rotation provides image information for a view range of 180 degrees for three dimensional reconstruction.

It is submitted that, although Nambu et al. states that three-dimensional reconstruction is provided, there is no teaching or suggestion of rotating C-shaped arm 204 in the configuration cited by the Office in the manner necessary to provide CT reconstruction. Although the movement configuration shown in Fig. 80A would provide up to about (but less than) 90 degree movement of X-ray detector 203, and could provide an additional 90 degrees of movement in the manner described at col. 58, line 26+, it does not show how rotation about 180 degrees plus of a fan angle could be accomplished.

Furthermore, the tomographic mode that is disclosed by Nambu et al. is different from the computed tomography claimed by applicant. For example, although there is a rotation B2 shown in Figure 14 that might be able to rotate x-ray source 12 and detector 14 through a large angle, there is nothing inherent in the teachings of Nambu et al. to indicate what angles the C-arm can actually rotate in this direction. Moreover, it appears that the rotations B1 and B2 in Figure 14 are provided for the original positioning of source 12 and/or detector 14 rather than collection of image data while rotation is actually occurring. For example, in Figure 9C of Nambu et al., a tomographic mode of operation is shown in which source 12 is moved and detector 14 is kept stationary. Thus, it is submitted that the structures taught and suggested by Nambu et al. are configured to operate in a tomographic mode consistent with Figure 9C. Thus, Nambu et al. does not teach or suggest an apparatus in which a source and a detector are attached to a mechanical positioning means, the mechanical positioning means is rotated about an angle of 180 degrees plus a fan angle while emitting x-rays from the x-ray source and signals from the detector assembly are collected, and wherein such signals are used to generate an image.

By contrast, Claim 1 as herein amended recites "... positioning the source assembly and the detector assembly in a first position using the mechanical positioning means for the first mode of operation, wherein the source assembly and the detector assembly are attached to the mechanical positioning means, and rotating the mechanical means for positioning about an angle of 180 degrees plus a fan angle while emitting x-rays from the x-ray source and collecting signals

from the detector assembly in the first mode of operation; ... and generating an image of the object for each determined mode of operation, wherein, for the first mode of operation, said generating an image includes using said collected signals from the detector assembly in the first mode of operation." See Applicants' specification at page 9, lines 9-14.

Because no such motion of a mechanical means and the concurrent collection of data is shown or suggested by configurations disclosed by Nambu et al., it is submitted that Claim 1 is neither anticipated nor rendered obvious by Nambu et al., and thus is patentable over Nambu et al.

Claims 4, 18, and 36 each recite features similar to those recited by Claim 1 that patentably distinguish Claim 1 from Nambu et al. It is therefore submitted that Claims 4, 18 and 36 are patentable over Nambu et al. for reasons similar to those given with respect to Claim 1.

Claims 2-3 depend, directly or indirectly, upon Claim 1. When the recitations of Claims 2-3 are considered in combination with the recitations of Claim 1, it is submitted that Claims 2-3 are likewise patentable over Nambu et al.

Claims 5-17 depend, directly or indirectly, upon Claim 4. When the recitations of Claims 5-17 are considered in combination with the recitations of Claim 4, it is submitted that Claims 5-17 are likewise patentable over Nambu et al.

Claims 19-35 depend, directly or indirectly, upon Claim 18. When the recitations of Claims 19-35 are considered in combination with the recitations of Claim 18, it is submitted that Claims 19-35 are likewise patentable over Nambu et al.

For the above reasons, it is requested that the section 102 rejection of Claims 1-36 over Nambu et al. be withdrawn.

It is further submitted that it is well-known that satisfactory CT image reconstruction requires the collection of data from a view angle range of at least 180 degrees plus a fan angle. It is clear that Nambu et al. do not show or suggest a way in which the configurations described therein can provide such a range of view angles. Therefore, although the range of rotation is not explicitly stated in the claims previously considered (i.e., prior to this Amendment), it is

submitted that this inherent requirement of CT imaging cannot be met by the configurations of Nambu et al. Thus, even the recitation of CT imaging in Applicants' unamended claims therefore should be sufficient to patentably distinguish Applicants' claimed invention from the disclosure of Nambu et al.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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